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To: Beth Walden **Date:** May 23, 2008

From: Sandip Chattopadhyay

Subject: Review Comments on "Treatability Study Work Plan Cap Material Assessments", prepared by MACTEC, dated 4/1/2008.

Olin/MACTEC has submitted this report as a work plan and planned to present the technical approach for the evaluation of potential cap materials suitable for covering OU 2 Basin sediments. This document very briefly described selected capping materials, depositional environment, physical characteristics of sediments, mercury distribution, conceptual design of treatability study and procedures for collection of sediment samples/cores for physical-chemical analyses, sampling equipment decontamination, surface water collection, sediment sample collection, and Asiatic clams sample collection. The document lacks the clarity and concept of the treatability study. The selection criteria of cap materials, proof of concept for application of these materials, description and goal of the treatability studies and performance criteria of the monitoring parameters were neither included nor clarified in this document.

1. Capping Alternatives (Section 2.1 - page 2-1). The selection criteria of the cap alternatives need to be described. Why these materials have been selected? How they are expected to be performed under the site specific conditions? Are these materials proven to immobilize mercury (Hg) and reduce methylmercury (MeHg)? Are these results reported in peer-reviewed journals?

2. What is meant by the well-graded sand? Will it compose of quartz material or silty sand? What will be the source of these materials (bulk purchase of sand as building materials or excavated sandy material from a site)? Will this sand material be considered as the control (quartz being inert) to evaluate performance of the alternate capping materials?

3. What is the "native material cap material" from the "quarries or dredge spoils in the Mobile area?" Is it clay, sandstone, limestone or any other mineral? The material and chemical compositions of cap materials including presence of trace elements (arsenic, chromium and other RCRA metals) need to be measured. Will this material be processed? If so, how much of organic matter will be present in this material?

4. Why AquaBlok® has been selected? Has AquaBlok® been used capping Hg contaminated sediment? If so, we need like to see the appropriate peer-reviewed reports/journal publications (not vendors' presentation/marketing materials). What is the mechanism of attenuation of Hg by the AquaBlok®?

5. Why CETCO reactive core mat has been selected? What is the native cap material along with the reactive core mat? Has CETCO reactive core mat been used capping Hg contaminated sediment? If so, please provide the appropriate peer-reviewed reports/journal

publications (not vendor's presentation/marketing materials). If the core material is organoclay, CETCO claims its effectiveness on PAHs, PCBs, and organomercury (not mercury). What will be potential impact of the organoclay MRM™ on the benthic organisms? Is this organoclay surfactant-modified, contains quaternary ammonium or similar compounds?

6. In the background section (Section 2.0), it was mentioned that "these layers may include materials that absorb or treat contaminants and, therefore, reduce the flux of contaminants." It is important to provide the proof-of-concept that these materials (or selected material) have significant sorption capacity. It is also essential to calculate the expected reduction in chemical flux compared to the ESPP or no remediation activity.

7. Olin/MACTEC can consider a hydrophobic or carbonaceous material (for example, coke/coal) that has a high sorption capability, a natural mineral that can form amalgam of Hg, or a sulfidic material that can transform to stable mercuric sulfide or cinnabar. However, it is essential to test the sorption capacities leaching potential and toxicity (both acute and chronic) of these selected cap materials under site-specific conditions prior to conducting remediation design at the Olin Basin.

It is essential that the following tests to be conducted prior to selecting any remediation design at the Olin basin.

- Chemical and physical Characterization of the sediment and cap materials, including total RCRA metals, specific gravity, moisture content, grain size analysis, bulk density, plasticity, total organic carbon, pH, ORP.
- Toxicity characteristic leaching procedure (TCLP) on the cap materials and sediment: To determine the mobility of inorganic and organic analytes present.
- Sorption capacity of potential cap materials: To evaluate potential for sequestering Hg present in the sediment/pore-water system.
- Kinetics of the sorption of Hg by potential cap materials: To determine the rate at which the materials can sequester Hg.
- Sorption capacity of the Olin sediment: To determine the rate of desorption of Hg from the sediment.
- Constant pH Leaching Procedure (CpLP): To determine effects of pH on leaching of RCRA metals.
- Settling velocity of the cap materials: To determine how quickly each material settles in water.

8. The modeling did not conclude that after construction of the berm and gate system, the conditions are conducive for highly depositional. Please provide the data to indicate deposition of natural sediments.

9. Even though Olin document does not provide any details of the cap materials, their properties, and ability to attenuate Hg, it should be noted that a marketing document/presentation reporting a commercial product claiming their effectiveness as sorption media is not acceptable.

10. The Figure 4-1 (not referred within main text) showed as a schematic of typical tube. It is not understandable how Olin has selected the diameter and height. There is no mathematical explanation of the selection of the L/D ratio of the tube. The depths of water and sediment selection criteria need to be explained. There is very little information provided in the report to support the conceptual design of the treatability study. It is not clear that how the 3ft (diameter) x 6ft (height) tube provide a "representative approach" of the conceptual design. Olin needs to

provide the details of the performance criteria of various parameters to be tested to evaluate the effectiveness of the cap materials. Olin needs to provide back up peer-reviewed published literature on similar design of the tubes as acceptable representative approach for conceptual design for remediation of Hg-contaminated sediment.

11. It is expected that it will take longer time than that Olin has proposed to observe/evaluate any parametric changes in the sediment-water systems. The selection of the monitoring period, schedule, and the performance parameters need to be specified. The Tables (or the footnotes) or Appendix B attached with the Word Plan do not explain these items.

12. How Olin will install the cap material and reactive core mat within the test (tube) area? Olin has characterized the sediment "as soft." It is a practice to test the bearing strength (Plastic Limit and Plasticity Index). Will sediment physical analysis include testing of these parameters?

13. The Work Plan does not include any use of any monitoring instrument/assessment tools (such as, UltraSeep® Meter to measure groundwater discharge rates and contaminant seepage in regions of groundwater migration and/or tidal influence; Trident® Probe, a direct-push, sub-surface screening probe to identify areas of groundwater discharge to surface water based on temperature and conductivity contrast with additional capability of collecting water samples for chemical analysis; benthic flux sampling device to measure diffusional fluxes of contaminants between sediment and overlying water; sediment profile imaging; and other monitoring device).

14. How the uniformity of cap thickness be verified?

15. How the proposed cap thickness (1ft for sand and native cap, 0.5 ft for CETCO mat, AquaBlok®, and others) were determined? The justifications of the selection of these thicknesses with respect to potential mass flux, life of the materials, prior experience of usage of similar materials and their performance in peer-reviewed literature on Hg-contaminated sediments should be provided.

16. How the re-suspension of cap materials or sediments and potential for intermixing be monitored? Core sampling will not address these issues.

17. Why instead of using a Kemmerer, Van Dorn, or other type of sampler capable of collecting water samples from specific depth, peristaltic pump is used?

18. It has been proposed to analyze all constituents, except methylmercury, at the Pace Analytical Laboratories and MeHg at the Battelle Laboratory in Sequim, Washington. What protocol will be followed to ensure the validity of the Hg and MeHg results from these two different laboratories?

19. The reporting limits of the analytes need to be included in the Table 3-1.

20. There are no replicates of the four tubes of cap materials at each location. Considering the variability of Hg distribution at this site, how Olin plans to evaluate the effectiveness of cap without replicates.